Unveiling Galaxy Evolution Dependency on Local Environment of Galaxies Using DESI EDR1

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Inspired by the James Webb Space Telescopes, this study uses the Dark Energy Spectroscopic Instrument Early Data Release 1 (DESI EDR1) to examine the influence of local environments on galaxy evolution. Mechanisms driving galaxy development, including star formation, mergers, and environmental interaction was explored by analyzing galaxy positions, redshifts, and fluxes. Advanced techniques, such as magnitude conversion, redshift processing, and Sersic index analysis were used to classify galaxies into distinct morphological types. This study found a strong correlation between galaxy characteristics and their surrounding environments. Denser areas mostly host elliptical galaxies with older stellar populations and lower star formation rates. However, less dense regions are populated by younger, spiral galaxies exhibiting higher star formation activity. The analysis of the D4000 index and specific Star Formation Rates (sSFR) further reflects the aging process and star-forming dynamics of galaxies in various environments. This study also analyzes spatial distributions and local densities to reveal insights into the impact of environmental factors on galaxy interactions, especially mergers. This research contributes to a deeper understanding of the complex relationship between internal galaxy processes and external environmental factors, providing a more comprehensive view of galaxy evolution in the cosmos.

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